



Valve Regulated Lead-Acid Batteries

Leading the Field in
Energy Storage Systems

Transportation FOR THE 21ST CENTURY

ENERGY
EFFICIENCY AND
RENEWABLE
ENERGY

OFFICE OF
TRANSPORTATION
TECHNOLOGIES



Background

Development of the sealed-lead-acid battery began in 1967 with its first commercial uses in the early 1970s. Over the past twenty years, the U.S. Department of Energy (DOE) has cooperated with the national laboratories, private industry, and academia to carry out research and development on storage battery technology. In the late 1970s, DOE began working closely with Gould Corporation (now GNB Technologies) to lower the cost and reduce maintenance of sealed lead-acid batteries. Through a cost sharing agreement, DOE-supported research at Sandia National Laboratories (SNL), Argonne National Laboratory, and GNB has led to the development of sealed valve regulated lead-acid (VRLA) batteries for electric utilities and electric vehicle applications.

The Technology

VRLA batteries operate as a starved electrolyte system in which the quantity of electrolyte is limited to the amount that either is absorbed in the plates or wets the fibers in the separator. The resulting system allows gases produced during overcharge to diffuse from one plate to the other and to be recombined back in the electrolyte. This recombination creates a closed system, thus reducing the release of gases into the atmosphere under normal overcharge conditions. Since the electrolyte is recycled, there is no need to

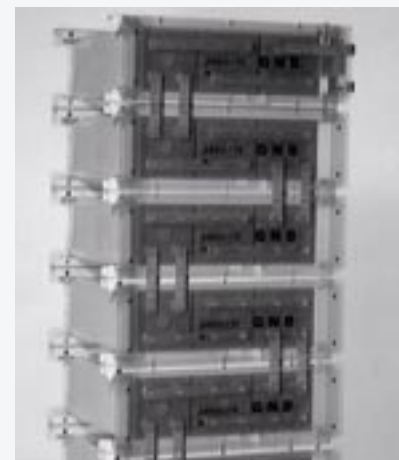
add water to the batteries. This reduced maintenance leads to a longer-life battery in a clean and compact package that can be installed when flooded cell batteries are impractical.

Commercialization

In 1983, GNB revolutionized the battery industry by introducing the first large-capacity, sealed VRLA battery, *Absolyte*, to the industrial market. GNB, with guidance from SNL, analyzed a variety of lead electrode compositions and developed manufacturing techniques to increase the density of the active materials in the positive and negative electrodes of the VRLA battery. As a result, VRLA batteries have 15% greater energy output compared to lead-acid batteries of the same size. Since 1983, GNB and SNL have continually improved product design and manufacturing processes in order to meet the growing needs of deep-cycle battery consumers. The battery testing facilities at SNL were critical in verifying performance characteristics to meet these needs. Today's *Absolyte XL* is the fourth generation to bear the *Absolyte* name. GNB now processes more than 10,000 used lead-acid batteries per day and reclaims 97% of the lead. Last year, GNB estimated that worldwide sales of its VRLA products exceeded \$225 million. To date, there are over 5 megawatt-hours of VRLA batteries in use throughout the United States.

Benefits

- 15% greater energy output
- Recycling reclaims 97% of lead
- Tolerant of freezing conditions
- Virtually leak free



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